Sandy Hook Unit, Gateway National Recreation Area, New Jersey

Sand Slurry Pipeline Cyclical Beach Replenishment

ESSENTIAL FISH HABITAT ASSESSMENT

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INTRODUCTION

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, this assessment identifies the potential impacts of the National Park Service (NPS), Gateway NRA, Sandy Hook Unit proposed Sand Slurry Pipeline on essential fish habitat (EFH) at Sandy Hook, New Jersey (Figure 1). The Magnuson-Stevens Act as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267) set forth a number of new mandates for the National Marine Fisheries Service (NMFS), regional fishery management councils, and other federal agencies to identify and protect important marine and anadromous fish habitat.

The councils, with assistance from NMFS, are required to delineate "essential fish habitat" for all managed species. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish (either currently or historically) and their associated physical, chemical, and biological properties; "substrate" to include sediment, hard bottom and structures underlying the water; and, areas used for "spawning, breeding, feeding, and growth to maturity" to cover a species' full life cycle. Prey species are defined as being a food source for one or more designated fish species, and the presence of adequate prey is one of the biological properties that can make a habitat essential.

Federal agencies that fund, permit, or carry out activities that may adversely impact EFH are required to consult with NMFS regarding the potential effects of their actions on EFH. According to NMFS, the contents of this EFH assessment include:

1) A description of the proposed action;
2) Analysis of the effects of the proposed action on EFH, the managed fish species, and major prey species;
3) The federal agency's views regarding the effects of the proposed action on EFH; and,
4) Proposed mitigation, if applicable.

Further, this document provides a list of EFH-designated species in the Study Area, references to related studies about the presence or absence of EFH-designated species in the Study Area, and an EFH Assessment Worksheet summarizing pre-project habitat characteristics and potential impacts associated with the proposed beach nourishment project as Appendix A.

Figure 1. Sandy Hook Project Area, Gateway NRA

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PROPOSED PROJECT ACTIVITIES

Sandy Hook, the northernmost 7 miles of barrier beach along New Jersey's coast, has a long history of persistent shoreline erosion and change. A four-mile seawall constructed in the early 1900's immediately adjacent to the National Seashore has effectively prevented the natural transport of sediment into Sandy Hook. This long-standing artificial structure has resulted in steepened nearshore slopes and significant shorelines retreat at its northern terminal- the southern beaches (Critical Zone) of Sandy Hook.

Since its inception as a National Recreation Area (NRA) Unit in 1974, the National Park Service (NPS) has attempted to maintain Sandy Hook's shoreline in order to provide continued recreational opportunities and protect its significant natural and cultural resources. Accelerated erosion with subsequent shoreline retreat due to the adjacent man-made structures threaten Sandy Hook's resources as well as the NPS' present level of use and operations. Continued erosion will likely result in a breach to the peninsula, damage NPS physical and historical facilities and beaches, and severely restrict access by the public and tenants.

Since 1976, the NPS has been pursuing and evaluating practical alternatives to address this problem and provide for continued operations and access to NPS resources, while minimizing adverse impacts to its exemplary cultural and natural resources. Two alternatives have been identified and evaluated in an Environmental Assessment including (A) No Action, and (B) Slurry pipeline. The slurry pipeline action alternative has two options for sand removal; crane and clamshell bucket for sand removal, and crane with eductor for sand removal. Each of these alternatives and options may have an impact on the shoreline as well as the protected species which inhabit the beach.

NPS has prepared a Biological Assessment Pursuant to Section 7 of the Endangered Species Act (ESA) in order to evaluate the potential effects of each of the alternatives on the three federally Threatened or Endangered Species that occur within the project area as well as this EFH Assessment. Consideration is also given to the two species listed by the state of New Jersey, seabeach knotweed (*Polygonum glaucum*) and the least tern (*Sterna albifrons*). The four species of protected sea turtles, the green sea turtle (*Chelonia mydas*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), the leatherback sea turtle (*Dermochelys coriacea*), and the loggerhead sea turtle (*Caretta caretta*) and a host of marine mammals that occur in the area but are not likely to be present or negatively impacted by project activities are also addressed.

Proposed Project Description

This Sand Slurry Pipeline system would maintain shoreline equilibrium by placing small volumes of sand on an annual basis. The project objective is to simulate the most natural possible sand transport and equilibrium along Sandy Hook in the context of the adjacent stabilization perturbation. This would require a pipeline that borrows sand from the northern, accreting portion of the Hook (Gunnison Beach) and deposits it on the eroding southern beach (Critical Zone). This system would provide NPS the flexibility of recycling from 0- to 100,000 cubic yards annually (as needed) to maintain shoreline equilibrium. This system would utilize the sand moving through the Sandy Hook nearshore sediment transport in the form of longshore, swash bars, and migratory shoals.

The project entails the construction of a pipeline for the periodic transport of sand from Gunnison Beach (accreting) to the Critical Zone at South Beach (eroding). It would pump a maximum of 100,000 cubic yards during suitable weather conditions during the months of October through February. The quantity depends on accretion at Gunnison Beach and sand extraction is anticipated to occur primarily from the swash bar and migratory shoals that weld onto the beach face and extend the intertidal zone seaward.

Infrastructure to be constructed includes a slurry pipeline, concrete pads along the pipeline to support temporary pumps, and connection points at each end of the pipeline to accommodate temporary pipe that would extend to the source and discharge beaches (2,000 feet and 1,400 feet, respectively). The enclosed pump house facility would be located inland of the dunes behind Gunnison Beach and another, smaller pump mounted on a moveable platform that would be placed near the crane on the bathing beach at Gunnison only during the pumping window (October-February). The pipeline, which would consist of an 11-18 inch diameter, high-density polyethylene pipe, would be installed in a trench adjacent to the existing road. Life expectancy of the pipeline infrastructure is estimated at 30 years.

The back-passing method proposed here is modeled after the facility specifications developed for the Indian River sand bypassing system in Delaware which is described in (Clausner *et al.* 1992, Rambo *et al.* 1991, Watson *et al.* 1993). That system, designed to move 100,000 cy/yr, has averaged 1500 cy/day on a 4 day/week, 6.5 days/month schedule within the Labor Day to Memorial Day window.

Sandy Hook project proposes to extract the slurry during the winter months to take advantage of the larger amounts of sand available in migrating shoals as well as transport rates. The sand by-pass system involves these basic steps. First the water is suctioned from the ocean and pumped through the pumping facility to the (sand removal end) eductor at the water's edge (Figures 2a and b). The eductor excavates sand, creating a slurry, while suspended and deployed by a crane at the borrow site (Figures 3a and b). The slurry is then pumped back through the pumping facility and out into the pipeline to the deposition area (Figures 4a and b). The Sandy Hook system would be similar except that it would require the use of 2-3 booster pumps along the pipeline due to the length of sand transport.

The dimensions of the excavated area produced by a stationary dredge are expected to be approximately 150'l X 60'w X 6'd. The excavation, however, would be conducted in the intertidal zone and on the attached migratory shoal where the slurry mixing is more efficient. Therefore, the excavation area begins to fill as quickly as it is created. A crane, situated near the berm above the high tide line, suspends the pipe and dredge (eductor assembly) out into the intertidal zone where it is able to excavate a trench about 150'l X 60'w X 6'd without moving its location. This is the largest area of excavation used at the DE site and anticipated at Sandy Hook. Typically, the dredge will remain in one stationary location all day as it dredges most efficiently in the intertidal zone. Depending upon the amount of sand in the migrating bars, the crane would stay in its location as new sand became available, or would move up to 3 times that distance to acquire more sand in the bar. At most the dredge area would cover up to 450 feet in length. Each time it moves, the depression left behind is expected to fill within two tide cycles from the natural current and sediments.

Once a shoal welds onto the beach face, the crane would be transported to the area immediately landward of the berm crest. The crane boom would then extend out to 150 feet or until the sand extraction was complete. The crane would be moved along the beach to follow the welded shoal along the Gunnison Public Beach. This process would continue as these bars would be targeted and sand extracted throughout the October through February window, the time when the shoals are most active and sand transport is maximized. Minimal beach disturbance is anticipated by the crane that would move only short distances and infrequently to tap these shoals. Disturbance to the intertidal zone is expected to be minimal, as longshore currents will continue to transport sand into the borrow sites. The crane would transverse the beach in one corridor and then move along the edge of the beach face to harvest the sand from the shoal as indicated in Figure 5.

With maximum borrow (100,000 cy) removed, it would take 50 pumping days of 2,000 cy. Recovery for the deposition slurry is expected within two days after pumping, and intertidal deposition is no longer expected to be visible after two high tides. The NPS proposes to pump for 50 days from October through February at an average rate of 2,000 cy/day. Because the passage of the migratory shoals occurs as a series of sediment pulses, the borrow period would attempt to capitalize on the pulse peaks, as detected by shoreline monitoring. At Gunnison Beach, the very high rates of alongshore sediment transfer would fill the dredge sites continuously during excavation, and largely eliminate the creation of sizeable craters in the beach face. There will be small, enclosed pumping facility, mounted on a moveable platform for transport, and operating at Gunnison beach during the pumping window. A few stationary pumps will be installed along the pipeline to keep the sediment moving to the deposition site.

Figure 2 (A & B). Sand slurry removal at borrow site (Indian River Inlet, DE) NPS 10/24/01

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Figure 3 (A & B). Eductor assembly unit (Indian River, DE) NPS 10/24/01

View GRAPHIC 5 File

Figure 4. Sand slurry deposition at the DE fill site, NPS 10/24/01

View GRAPHIC 6 File

Figure 5. Slurry extraction schematic

View GRAPHIC 8 File

Slurry will be piped to the Critical Zone beach where it will be ejected out onto the beach face and intertidal zone (Figure 4). The pipe will be moved when necessary by dragging it with a tracked vehicle to build the Critical Zone up to the Parking Lots. If it were deemed necessary to restore the fill area beach profile prior to March 1, bulldozers would be used to push remaining sand mounds and restore the appropriate beach profile. Since, however, sand will be deposited seaward of the upper beach during the dynamic winter months, it is expected that the fill will be shaped by weather and ocean conditions. The fill area is expected to impact a maximum of 3 acres over the winter period, as sand slurry pulses out the outflow pipe onto the lower beach face and onto the intertidal zone, where some sediment will be carried by longshore currents along the beach for a short distance before settling. Protective fences or temporary barriers and educational signs will surround the project activity, both at the borrow and fill areas for public safety and education.

A monitoring program will be established to measure beach profile, erosion and accretion at various points along the Atlantic shoreline of Sandy Hook throughout the year, including Gunnison Beach and the nourishment site. Monitoring of the intertidal zone and beach profile at the borrow and fill areas will be conducted to determine recruitment and recovery of macroinvertebrate populations. A comprehensive plover, amaranth and tiger beetle monitoring program will be adhered to in order to manage for these protected species. Crane operators and NPS staff will monitor intake and outflow sites for any sign or incidental take of aquatic species, however it is doubtful that any adult or juvenile mobile species would be present.

EXISTING ENVIRONMENT

Sandy Hook is an 1825-acre (730 hectare) accreting, recurved barrier spit extending northwest from central New Jersey into lower New York Bay. There are approximately 7 miles (11.2 km) of ocean shoreline, varying in width from 0.06 mi to1.02 mi. (0.1 to 1.7 km). The Atlantic Ocean is to the east and Sandy Hook Bay is to the west. Sandy Hook lies at the northern end of the barrier island system of New Jersey. It remains one of New Jersey's most heavily-used beaches and best examples of a "natural" beach community and shoreline (Figure 1). It is culturally rich as well and contains the oldest operating Lighthouse in the U.S. as well as Fort Hancock, which guarded the harbor for nearly a century.

Sandy Hook is administered by the NPS as a unit of Gateway National Recreation Area (NRA). Gateway NRA preserves unique biological and cultural sites in and around New York Harbor. Over two million people visit Sandy Hook annually, with about 46,000 visitors on summer weekends. Most use the ocean beaches for swimming and surfing, sunbathing, picnicking, beach walking, kite flying, and fishing. NPS management for human disturbance established six protected areas that contain all of the nesting piping plovers (as well as other rare beach flora and fauna). These areas comprise almost 50% of the Sandy Hook shoreline and about 90% of the wide, northern beaches.

Like most barrier island and spit systems, Sandy Hook has experienced dynamic geomorphologic changes (Figure 2). Within the last two centuries alone, it has been an island, it has been connected to the mainland at two different sites; and it has had as many as four inlets joining the ocean and the Navesink- Shrewsbury River system (Gorman 1988, Gares 1981). Beginning in 1900, however, significant effort and commitment was made to stabilize the New Jersey coast. These shoreline stabilization efforts have significantly affected the geomorphologic dynamics of Sandy Hook, creating an unnatural near-shore sand transport system. These established and permanent man-made structures along adjoining townships pose a challenge to NPS management and operations on the NRA.

This elongate sandy spit of recent geological age extends northward from the coastal headlands and separates the Navesink Highlands from the Atlantic Ocean. Waves approach Sandy Hook shoreline from a southern orientation, generating a prevailing northward longshore current that carries littoral drift resulting in this northward expanding barrier peninsula. It is estimated that 350,000cy of Longshore sand pass through Sandy Hook, with 500,000cy/yr leaving the Sandy Hook system passing the northern tip of the peninsula. Sandy Hook Project area sediment is composed of well-sorted, medium-sized sand, with a mean grain size of 0.4-0.5 mm, 80% of which is quartz derived from the local headlands (Atlantic Highlands and Shrewsbury rocks). At least 5-10% of the remaining sediment consists of glauconite also derived from the local area.

Average wave height is approximately 1.5 feet and storm waves can reach up to 6 feet. Semidiurnal tides have a mean tidal range of 4.4 ft, with spring tidal ranges of 5.3 ft. Mean tide level is 2.2 feet above mean low water. Prevailing winds are seasonal, with southerly winds predominating from May through September and westerly from October through March. Moderate wind velocity from 14-28 mph predominates, with nor'easters and hurricanes producing greater velocities and highly erosive forces. Since 1938, 5 hurricanes and 4 extra tropical storms have impacted the Sandy Hook shoreline. The beach is frequently altered by storm events that mobilize the entire beach zone by transferring great quantities of sand to the offshore as well as downdrift at least 12 times per year.

Water quality conditions are affected to some extent by effluents leaving New York Harbor, as well as local drainage from sewers. Beaches meet primary contact recreation standards, although the waters of the offshore Sandy Hook Borrow site are condemned for shellfish harvesting but otherwise adequate for other marine water uses. Water temperatures ranges from winter temperatures of 22-23°C to summer temperature of 20-25°C. Salinity for this open ocean environment is around 35parts per thousand with little variation.

The shoreline environment includes subtidal and intertidal areas and hosts a variety of bottom-dwelling organisms and phytoplankton. This shallow, inshore environment is affected by the scour of high energy storm waves which interrupts the general stability of this ocean habitat as well as the successional stages of benthic fauna

EFH species and their life history stages in the project area are listed in Table 1.

EFH-DESIGNATED SPECIES

The Northeast Fisheries Science Center compiled available information on the distribution, abundance, and habitat requirements for each species management by the New England and Mid-Atlantic Fishery Management Councils. That information, the NMFS Source Documents, from the National Oceanic and Atmospheric Administration (NOAA) NMFS EFH website, was used as the basis for EFH designations for finfish species throughout the northeast. EFH designations for the Sandy Hook Shoreline are presented in Table 1. They are based on qualitative evaluations of the presence and relative abundance of federally managed species in different life history stages and salinity zones in the estuary, by experts who were consulted in the process of developing information for the NOAA Estuarine Living Marine Resources (ELMR) program (Stone *et al*. 1994).

Studies have been conducted in the vicinity of the project site and are referred to here.

Intertidal Zone Habitat

The upper marine intertidal zone is also primarily barren; however, more biological activity is present in comparison to the upper beach. Organic inputs are derived primarily from the ocean in the form of beach wrack, which is composed of drying seaweed, tidal marsh plant debris, decaying marine animals, and miscellaneous debris that washed up and deposited on the beach. The beach wrack provides a cooler, moist microhabitat suitable to crustaceans such as the amphipods: *Orchestia spp*. and *Talorchestia spp*., which are also known as beach fleas. Beach fleas are important prey to ghost crabs. Various foraging birds and some mammals are attracted to the beach fleas, ghost crabs, carrion and plant parts that are commonly found in beach wrack. The birds include gulls, shorebirds, fish crows, and grackles.

Benthos of Intertidal and Subtidal Zone

The US Army Corps of Engineers (ACOE), through its Biological Monitoring Program, analyzed data collected for a restoration project to the south of Sandy Hook between Asbury Park and the Manasquan River. The intertidal benthos, prior to placement of fill, were dominated by three taxa: Rhynchocoela, the spionid polychaete, *Scolelepis squamata*, and Oligochaeta. Rhynchocoelas were the most abundant organism (66%), *Scolelepis* (16%), and Oligochaeta (14%) of total abundance (ACOE 1998). Eddings *et al.* (1990) conducted limited sampling on the northern beaches of Sandy Hook, but did not analyze the core samples by prey base type. Local sampling methods were not comparable to those of the BMP of ACOE, and no data exist on benthic fauna of the Critical Zone area. Due to the proximity of sandy Hook to the ACOE sampling areas, the faunal is expected to be quite similar.

Macroinvertebrate populations are subject to significant seasonal variations. However, the ACOE study identified high densities at specific sites and times rather than a consistent difference between areas, stations, or seasons. In terms of impacts to the fauna in the swash zone, there was no statistical difference in abundance, diversity, composition, or total biomass between samples collected before and after nourishment in their adjacent study areas (ACOE 1999a, 1999b, 2001a). The ACOE BMP found that complete recovery of the intertidal infaunal assemblage occurred between two months and six and one half months. Because the area of impact is relatively small in the proposed pipeline project, recolonization is expected to occur much more rapidly than in the more extensive adjacent beach fill projects and is expected to be recovered within several tide cycles or two days.

Benthic invertebrates are an important link in the aquatic food chain and provide a food source for a variety of bottom feeding fish species. The organisms inhabiting the beach intertidal zone have evolved special locomotory, respiratory, and morphological adaptations, which enable them to survive in this extreme habitat. Organisms of this zone are agile, mobile, and capable of resisting long periods of environmental stress. Most are excellent and rapid burrowers. Frequent inundation of water provides suitable habitat for benthic infauna; however, there may be a paucity in numbers of species. Factors such as hydrography, sediment type, depth, temperature, as well as inter/intra specific population dynamics influence species dominance in benthic communities. Intertidal benthic organisms tend to have a high rate of reproduction and a short (1-2 years) life span (Hurme and Pullen 1988). Generally, coarse sandy sediments are inhabited by filter feeders and areas of soft silt or mud are more utilized by deposit feeders, however, considerable overlap can occur.

ACOE (2000) reports the results of October sampling in the Ocean City area.. The most dominant taxa found in both of these zones were the small common surf-zone clam (*Donax variabilis*), the highly mobile haustorid amphipod (*Amphiporeia virginiana*), the mole crab (*Emerita talpoida*), and the mobile polychaete (*Scolelepis squamata*). Comparisons were made in this study between the sand-filled area of Ocean City where the currently authorized Federal beach replenishment project is located and remaining undisturbed areas throughout the study area. ACOE (2000) found that the mean number of taxa, total abundance, and total biomass were higher in the sand-filled area samples of the intertidal zone; however, total biomass was significantly lower in the sand-filled area of the nearshore subtidal zone.

Man-made structures such as seawalls, jetties, and groins provide habitats for aquatic and avian species. Benthic macroinvertebrates such as barnacles (*Balanus balanoides*), polychaetes, molluscs (*Donax spp.*), small crustaceans such as, mysid shrimp (*Heteromysis formosa*), amphipods (*Gammarus spp.*), and uropods (*Idotea baltica*), reside on and around these structures. The blue mussel, *Mytilus edulis*, is a dominant member of this community. Sea gulls and other water birds use them for perching, loafing, roosting, and foraging sites.

Interstitial species (meiofauna) are present feeding among the sand grains for bacteria and unicellular algae, which are important in the beach food chain. Meiofauna are generally < 0.5 mm in size and are either juveniles of larger macrofauna or exist as meiofauna during their entire life cycle. Some common meiofauna include Rotifera, Gastrotricha, Kinorhyncha, Nematoda, Archiannelida, Tardigrada, Copepoda, Ostracoda, Mystacocarida, Halacarida, and many groups of Turbellaria, Oligochaeta, and some Polychaeta.

Nearshore and Offshore Zone

The nearshore coastal zone generally extends seaward from the subtidal zone to beyond the breaker zone (ACOE 2000) and is characterized by intense wave energies that displace and transport coastal sediments. The offshore zone generally lies beyond the breakers and is a flat zone of variable width extending to the seaward edge of the Continental Shelf. Hurme and Pullen (1988) describe the nearshore zone as an indefinite area that includes parts of the surf and offshore areas affected by nearshore currents as their boundaries may vary depending on relative depths and wave heights.

Benthos of Nearshore and Offshore Zones

New Jersey Atlantic nearshore waters provide a dynamic environment heavily influenced by the tidal flows and long-shore currents (ACOE 2000). The nearshore and offshore waters of the New Jersey Coast contain a wide assemblage of invertebrate species inhabiting the benthic substrate and open water. Invertebrate Phyla existing along the coast are represented by Cnidaria (corals, anemones, and jellyfish), Annelida (Polychaetes, Oligochaetes), Platyhelminthes (flatworms), Nemertinea (ribbon worms), Nematoda (roundworms), Bryozoa, Mollusca (chitons, clams, mussels, etc.), Echinodermata (sea urchins, sea cucumbers, sand dollars, and starfish), Arthropoda (crustaceans), and the Urochordata (tunicates).

Benthic investigations performed in 1999 (ACOE 2000) at several potential sand borrow sites offshore of the Ocean City area were dominated by polychaete worms, while the Corson Inlet area was dominated by the bivalve, *Donax fossor*. Amphipod crustaceans also contributed substantially to the faunal composition, but to a lesser extent in the offshore areas.

Larger benthic macroinvertebrates sampled in the Ocean City Study were obtained from commercial surfclam dredges in the same areas. The most frequently collected invertebrates included: surfclam, knobbed whelk (*Buscyon carica*), channel whelk (*Buscyon canaliculatum*), horseshoe crab (*Limulus polyphemus*), moon snail (*Polinices spp.*, *Lunatia spp.*), spider crab (*Libinia emarginata*), hermit crab (*Pagarus spp.*) and starfish (Echinodermata) (ACOE 2001a and b).

Plankton and Marine Macroalgae

Phytoplankton production is generally highest in nearshore waters and is dependent on factors such as light penetration, available nutrients, temperature and wind. Seasonal phytoplankton species associations are dominated by dinoflagellates in the spring-summer and diatoms in the winter, with fall being the period of transition.

A number of species of marine macroalgae occur in the area on man-made structures, sand beaches, in enclosed bays and tidal creek habitats. Distribution and abundance of algae is closely related to seasonal temperature, salinity variations, and nutrient levels coming from tributary streams. The densest populations occur in June through August when Rhodophyta (red algae) predominate benthic algae and Chlorophyta (green algae) are the predominant intertidal algae species. Phaeophyta (brown algae) such as rockweed (*Fucus spp.*) may be found attached or floating free around rock jetties and pilings or washed onto the shore to make up part of the wrack line.

Zooplankton, generally adrift in the water column, are yet another important link in the food chain. Many organisms are zooplankton in their early life stages and become nektonic or benthic in a later life stage. Zooplankton also exhibits seasonal variances in species abundance and distribution, attributable to temperature, salinity and food availability. In marine environments, seasonal zooplankton peaks can be correlated with phytoplankton peaks, usually in the spring and fall. Zooplankton species that are characteristic of coastal areas include: *Acartia tonsa, Centropages humatus, C. furatus, Temora longicornis, Tortanus discaudatus, Eucalanus pileatus, Mysidopsis bigelowi* (mysid shrimp), and *Crangon septemspinosa* (sand shrimp). Zooplankton species within the geographic area generally fall within two seasonal groups. The copepod, *Acartia clausi*, is a dominant species during winter-spring, and is replaced in spring by *A. tonsa*. Peak densities usually occur in late spring to early summer following the phytoplankton bloom (ACOE 2000).

Finfish

The range of ocean habitat, embayments and estuaries allows the coastal waters of New Jersey to have a productive fishery. Many species utilize the estuaries behind Sandy Hook Spit for forage and nursery grounds. The finfish found along the Atlantic Coast of New Jersey are principally seasonal migrants. Winter is a time of low abundance and diversity as most species leave the area for warmer waters offshore and southward. During the spring, increasing numbers of fish are attracted to the New Jersey Coast, because of its proximity to several estuaries, which are utilized by these fish for spawning and nurseries.

Species known to utilize estuaries along the Atlantic Coast of New Jersey include summer flounder (*Paralichtys dentatus*), sea bass (*Centropristis striata*), striped bass (*Morone saxatilis*), bluefish (*Pomatomus saltatrix*), witch flounder (*Glyptocephalus cygnoglossus*), winter flounder (*Pseudopleuronectes americanus*), tautog (*Tautoga onitiss*), weakfish (*Cynoscion regalis*), scup (*Stenotomus chrysops*), white perch (*Morone americana*), and Atlantic menhaden (*Brevoortia tyrannus*). In a study conducted at Peck Beach, 178 species of saltwater fishes were recorded, 156 of which were from the nearshore waters. Many species inhabit estuaries year-round; however, a large number of species only use estuaries for specific parts of their life history. Most species however, occur during the warm seasons and are not present during the colder winter months.

The estuarine marsh complex is an important nursery area for coastal New Jersey fisheries. The protection afforded by the relatively calm waters, added protection from offshore predators and abundant food sources enhance this habitat for early life stages.

Man-made structures within the study area such as groins and jetties add more habitat diversity within the study area for finfish. Juvenile and larval finfish such as black sea bass (*Centropristis striata*), summer flounder (*Paralichthys dentatus*), winter flounder (*Pseudoharengus dentatus*) and striped bass (*Morone saxatilis*) utilize these areas for feeding, protection from predators, and nursery habitat.

Recreational fishes in New Jersey include scup (*Stenotomus chrysops*), black sea bass (*Centropristis striata*), several flounder species, weakfish (*Cynoscion regalis*), bluefish (*Pomatomus saltatrix*), hake and mackerel species, Atlantic cod (*Gadus morhua*), northern kingfish *(Menticirrhus saxatilis*), tautog (*Tautoga onitiss*), and others. Commercially important species include menhaden (*Brevoortia tyrannus*), winter flounder, weakfish, bluefish, scup, mackerel, silver hake (*Merluccius bilinearis*), red hake (*Urophysis chuss*), yellow flounder, black sea bass, butterfish (*Perpilus triacanthus*), and shad (*Alosa mediocris*). Harvesting is accomplished by use of purse seines, otter trawls, pots, and gill nets.

Shellfish

Shellfish beds, ranging in quality and productivity, are found in the back bays and shallow ocean waters of the study area. Atlantic surfclams *(Spisula solidissima*), hard clams (*Mercenaria mercenaria*), blue mussels (*Mytilus edulis*) and blue crabs (*Callinectes sapidus*) are common commercial and recreational shellfish within the coastal waters of the study area. Surfclams are the largest bivalve community found off the Atlantic coast from the Gulf of Saint Lawrence, Canada to North Carolina. The blue crab and the hard clam are two of the most important invertebrates of recreational and commercial value along the New Jersey Coast, and are common in backbays and inlets.

The surfclam has a wide distribution and abundance within the mid-Atlantic Region. Surfclams most commonly inhabit substrates composed of medium to coarse sand and gravel in turbulent marine waters just beyond the breaker zone (Fay *et al*. 1983 on NMFS website). The abundance of adults varies from loose, evenly distributed aggregations to patchy, dense aggregations in the substrate.

The hard clam is an economically important shellfish of NJ back bays, supporting both commercial and recreational fisheries (ACOE 2001a and b). In addition to hard clam resources, the bays in the project area also support other species of shellfish. American oysters (*Crassostrea virginica*) are not usually present in commercially harvestable densities, but can be found throughout the project area. Soft clams (*Mya arenaria*) and blue mussels are primarily harvested for recreation, but occasionally commercial densities are present. Blue crabs are an important species in the backbay estuaries. Of all New Jersey's marine fish and shellfish, more effort is expended in catching the blue crab than any other single species. Surveys indicate that three-quarters of the state's saltwater fishermen go crabbing and that crabbing accounts for roughly 30 percent of all marine fishing activity.

The Shinnecock project (2001b) borrow site area falls within NMFS' designated EFH which extends offshore from the southern shore of Long Island. Included in the EFH are the following species: Atlantic salmon (*Salmo salar*), pollock* (*Pollachius virens*), whiting* (*Merluccius bilinearis*), red hake*, winter flounder* (*Pseudopleuronectes americanus*), windowpane* (*Scophthalmus aquosus*), ocean pout* (*Macrozoarces americanus*), Atlantic sea herring* (*Clupea harengus*), monkfish* (*Lophius americanus*), bluefish* (*Pomatomus saltatrix*), Atlantic mackerel* (*Scomber scrombrus*), summer flounder* (*Paralichthys dentatus*), scup* (*Stenotomus chrysops*), black sea bass* (*Centropristis striata*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorus maculatus*), cobia (*Rachycentron canadum*), sand tiger shark (*Odontaspis taurus*), blue shark (*Prionace glauca*), white shark (*Charcharadon carcharias*), dusky shark (*Charcharinus obscurus*), sandbar shark (*Charcharinus plumbeus*), tiger shark (*Galeocerdo cuvieri*) and skipjack tuna (*Katsuwonus pelamis*). Of the 24 listed species, 13 (marked with an asterisk) have been collected there in the WOSI Multi-Species Sampling Program. The numerically dominant fish collected, butterfish (*Peprilus triacanthus*), is not included in the EFH listing. In regards to megabenthic invertebrates, the only species shown in the EFH for the area is long finned squid (*Loligo pealei*). This species was collected in large numbers in the WOSI Multi-Species program.

The demersal fish and macrobenthic invertebrate communities were sampled at the off-shore Shinnecock Borrow Area. Finfish and macrobenthic invertebrate communities were collected monthly from April 1999 through April 2001. The most abundant fish species in the study area were benthic forms, such as summer flounder (*Paralichthys dentatus*), windowpane, and little skate (*Raja erinacea*). Many other inshore species likely migrated through the area during spring and fall migration, but were unlikely to establish residence in the area. These species included the sea herring (*Clupea harengus*), alewife (*Alsoa pseudoharengus*), American shad (*Alosa sapidissima*), Atlantic mackerel (*Scomber scombrus*), and weakfish (*Cynoscion regalis*).

The pelagic finfish community was also sampled monthly from April 1999 to April 2000. A total of 176 samples, six at each of the 16 stations, were collected. A total of 47 finfish species were collected. The dominant species collected was the butterfish. The 13,759 individuals collected represented 31.7 percent of the total catch. The second through sixth ranked fish species by abundance, were scup, bay anchovy, little skate, spotted hake (*Urophysis regia*), and winter skate (*Raja ocellata*), respectively. These along with windowpane, red hake, striped sea robin and silver hake, comprised 95 percent of the total catch.

The water column contained several marine species from different trophic levels throughout the year. The zooplankton population consisted primarily of several copepod species, such as *Acartia hudsonica, A. tonsa, Temora longicornis, Labidocera aestive,* and *Pseudocalanus spp*. Although ichthyoplankton surveys were not conducted in the ACOE Shinnecock field program, it was assumed that species spawning both offshore and in Shinnecock Bay could be transported through the study area. Since fish larvae fed primarily on zooplankton, the abundance and diversity of the fish larvae were strongly influenced by the zooplankton population. The developing larvae of both bluefish and summer flounder, which spawn offshore, drift inshore into the bays. Sea herring (*Clupea harengus*), red hake, spotted hake, and striped and northern searobin (*Prionotus evolans* and *P. carolinus*, respectively) are all nearshore spawners. The sandlance (*Ammodytes americanus*), an offshore and important bait fish species to many piscivorous fish, spawns throughout the winter months, and occurred in the study area.

Near shore benthic sampling (EEA, Inc. 1999) identified the presence of macrobenthic invertebrates from the wrack line to below the intertidal zone. Samples were dominated by the blue mussel (*Mytilus edulis*—77%) along with the class oligochaeta (7%), and the nemertean worms (6%), which accounted for 90 percent of all organisms sampled. These findings are supported by a 1998 sampling that was conducted by the ACOE on the beaches of New Jersey (ACOE 2001a). Off the beaches of Monmouth County, New Jersey, the Corps found a benthic community dominated by the polychaete worm (*Mageloma papillicornis*—36%), the dwarf tellin (*Tellina agilisa*—21%) and *nepthyid polychaetes*—14%).

Another ACOE adjacent study for the Ruritan River Basin Project sampled and compiled data on species present. Barno (1995) collected 11 species in an electro shocking survey below the Duhernal Dam, and only 1 species, the bluefish was EFH designated. The ACOE sampled Ruritan and South Rivers and Washington Canal in 1998 and collected 17 species, of which the bluefish was the only EFH designated species. September 2000 sampling reported 10 species, this time with both juvenile bluefish and winter flounder as EFH designated species collected (ACOE 2000).

Trawl samples were collected monthly from April 1999 to April 2000 resulting in a total of 176 samples, six at each of the 16 stations, were being collected. A total of 47 finfish species were collected. The dominant species collected was the butterfish. The 13,759 individuals collected represented 31.7 percent of the total catch. The second through sixth ranked fish species by abundance, were scup, bay anchovy (*Anchoa mitchilli*), little skate, spotted hake (*Urophycis regia*), and winter skate, respectively. These along with windowpane, red hake, striped searobin, (*Prionotus evolans*), and silver hake comprised 95 percent of the total catch (ACOE 2001a). A more detailed analysis of finfish is available in the Environmental Assessment for this project.

Bluefish and winter flounder are the only EFH-designated species that were found to occur in the adjacent study area of the Ruritan River Basin (ACOE 2000). Two cohorts of juvenile bluefish enter estuarine habitats in the New York Bight, one in late May and June and a second during mid to late August (Able and Fahay 1998). Based on their average size, juvenile bluefish collected in that Study Area appeared to belong to the first cohort, which is believed to originate from spawning in the South Atlantic Bight during late March or early April (Able and Fahay 1998). Winter flounder are apparently fairly rare in the Ruritan River Basin Study area, since only two juveniles were caught in September 2000 and none were collected in any of the previous surveys. Given their sizes (93 and 66 mm total length), these were young-of-the-year (YOY) juveniles derived from spawning in the winter and early spring. Both were caught below (south of) the Route 535 Bridge. Winter flounder spawn on a variety of substrates in shallow, nearshore waters of the Hudson-Raritan estuary during February and March (Pereira *et al*. 1999).

Several species of shark also potentially occur in the area, including the sand tiger shark (*Odontaspis taurus*), dusky shark (*Charcharinus obscurus*), shortfin mako shark (*Isurus oxyrhyncus*), sandbar shark (*Charcharinus plumbeus*), and tiger shark (*Galeocerdo cuvieri*). Two species of tuna, the bluefin tuna (*Thunnus thynnus*), skipjack tuna (*Katsuwonus pelamis*) potentially occur here as well.

Waters immediately adjacent to and offshore of Sandy Hook have been designated as EFH under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for many species of fish and these could also potentially occur in the waters off of Sandy Hook. These species include Atlantic salmon (adults), pollock (juveniles), whiting (eggs, larvae, juveniles), red hake (eggs, larvae, juveniles), winter flounder (all life stages), yellowtail flounder (eggs), windowpane (all life stages), ocean pout (eggs, larvae, adults), Atlantic sea herring (adults), monkfish (eggs and larvae), bluefish (juveniles and adults), long finned squid (juveniles),Atlantic butterfish (all life stages), Atlantic mackerel (all life stages), summer flounder (juveniles, adults), scup (juveniles, adults), black sea bass (larvae, juveniles, adults), surf clam (juveniles, adults), ocean quahog (juveniles, adults), king mackerel (all life stages), Spanish mackerel (all life stages), cobia (all life stages), sand tiger shark (larvae), common thresher shark (larvae, juveniles, adults), blue shark (larvae, juveniles, adults), white shark (juveniles), tiger shark (larvae, juveniles), dusky shark (larvae, juveniles), sandbar shark (larvae, juveniles, adults), shortfin mako shark (larvae, juveniles, adults), bluefin tuna (juveniles, adults and skipjack tuna (adults). Site conditions at both the borrow and placement areas determine the species and life stages which must be considered (NMFS 2003a).

Table 1. EFH-designated species and life history stages in the Sandy Hook Area. Source: NOAA (1999)

Summary of Essential Fish Habitat (EFH) Designation

10’ x 10’ Square Coordinates:

Boundary	North	East	South	West
Coordinate	40° 30.0’ N	73° 50.0’ W	40° 20.0’ N	74° 00.0’ W

Square Description (i.e. habitat, landmarks, coastline markers): The waters within the square both west of and east of the northern majority of Sandy Hook Peninsula. Also affected along with these waters include waters east of Sea Bright, NJ., and north of Monmouth, NJ., and waters within the eastern half of the Shrewsbury River and the very eastern portion of the Navesink River.

SPECIES	**EGGS**	**LARVAE**	**JUVENILES**	**ADULTS**
Atlantic cod *(Gadus morhua) Fahay 1998*				Habitat: Bottom (rocks, pebbles, or gravel) winter for Mid-Atlantic Prey: shellfish, crabs, other crustaceans, polychaetes, squid, fish (capelin redfish, herring, plaice, haddock).
whiting (Merluccius bilinearis) (Morse et al. 1998)	Habitat: Pelagic continental shelf waters in preferred depths from 50-150 m.	Habitat: Pelagic continental shelf waters in preferred depths from 50-130 m. (Morse et al. 1998)	Habitat: Bottom (silt-sand) nearshore waters in preferred depths from 150-270 m in spring and 25-75 m in fall. Prey: fish, crustaceans (euphasids, shrimp), and squids (Morse et al. 1998)	Habitat at borrow and fill site expected to remain the same except for temporary disruption of benthic prey
red hake (Urophycis chuss) (Steimle et al. 1998)	Habitat: Surface waters, May – Nov.	Habitat: Surface waters, May –Dec. Abundant in mid- and outer continental shelf of Mid-Atl. Bight. Prey: copepods and other microcrustaceans under floating eelgrass or algae.	Habitat: Pelagic at 25-30 mm and bottom at 35-40 mm. Young inhabit depressions on open seabed. Older juveniles inhabit shelter provided by shells and shell fragments. Prey: small benthic and pelagic crustaceans (decapod shrimp, crabs, mysids, euphasiids, and	

			amphipods) and polychaetes).	
*redfish (Sebastes fasciatus)	n/a			
*witch flounder (Glyptocephalus cynoglossus)		Habitat: Bottom descent in depths up to 25 m		
winter flounder (Pleuronectes americanus) (NOAA 1999) Pereira et al. 1998, McClane 1978)	Habitat: Mud to sand or gravel; from Jan to May with peak from Mar to April in 0.3 to 4.5 meters inshore; 90 meters or less on Georges Bank. 10 to 32 ppt salinity.	Habitat: Planktonic, then bottom oriented in fine sand or gravel, 1 to 4.5 m inshore. 3,2 to 30 ppt. salinity. Prey: nauplii, harpacticoids, calanoids, polychaetes, invertebrate eggs, phytoplankton.	Habitat: Shallow water. Winter in estuaries and outer continental shelf. Equally abundant on mud or sand shell. Prey: copepods, harpacticoids, amphipods, polychaetes	Habitat: 1-30 m inshore; less than 100m offshore; mud, sand, cobble, rocks, boulders. Prey: omnivorous, polychaetes and crustaceans.
*yellowtail flounder (Pleuronectes ferruginea)	Habitat: Pelagic, near surface, peak April to June	Habitat: Movement in water current- pelagic, peak in May - July		
windowpane flounder (Scopthalmus aquosus) (Chang 1998)	Habitat: Surface waters <70 m, Feb-July; Sept-Nov.	Habitat: Initially in pelagic waters, then bottom <70m,. May-July and Oct-Nov. Prey: copepods and other zooplankton	Habitat: Bottom (fine sands) 5-125m in depth, in nearshore bays and estuaries less than 75 m Prey: small crustaceans (mysids and decapod shrimp) polychaetes and various fish larvae	Habitat: Bottom (fine sands), peak spawning in May , in nearshore bays and estuaries less than 75 m Prey: small crustaceans (mysids and decapod shrimp) polychaetes and various fish larvae
Atlantic sea herring (Clupea harengus) (Reid et al. 1998)			Habitat: Pelagic waters and bottom, < 10 C and 15-130 m depths Prey: zooplankton (copepods, decapod larvae, cirriped larvae, cladocerans, and pelecypod larvae)	Habitat: Pelagic waters and bottom habitats; Prey: chaetognath, euphausiids, pteropods and copepods.
monkfish (Lophius americanus) (Steimle et al. 1998)	Habitat: Surface waters, Mar. – Sept. peak in June in	Habitat: Pelagic waters in depths of 15 – 1000 m along mid-shelf also found in surf zone		

	upper water column of inner to mid Continental shelf	Prey: zooplankton (copepods, crustacean larvae, chaetognaths)		
bluefish (Pomatomus saltatrix)	Habitat: Pelagic waters at mid-shelf depths	Habitat: Pelagic waters at mid-shelf depths	Habitat: Pelagic waters of continental shelf and in Mid-Atlantic estuaries from May-Oct. Prey: squids, smaller fish	Habitat: Pelagic waters; found in Mid-Atlantic estuaries April – Oct. Prey: squids, smaller fish
long finned squid (Loligo pealei)	n/a	Habitat: EFH for Pre-recruits is pelagic waters over the Continental Shelf		
short finned squid (Illex illecebrosus)	n/a	Habitat: EFH for Pre-recruits is pelagic waters over the Continental Shelf		
Atlantic butterfish (Peprilus triacanthus)	Habitat: Pelagic waters		Habitat: Pelagic waters in 10 – 360 m	Habitat: Pelagic waters Prey: jellyfish, crustaceans, worms, and small fishes
summer flounder (Paralicthys dentatus)		Habitat: Pelagic waters, nearshore at depths of 10 – 70 m from Nov. – May	Habitat: Demersal waters (mud and sandy substrates)	Habitat: Demersal waters (mud and sandy substrates). Shallow coastal areas in warm months, offshore in cold months
scup (Stenotomus chrysops)	n/a	n/a	Habitat: Demersal waters	Habitat: Demersal waters offshore from Nov – April
black sea bass (Centropristus striata)	n/a		Habitat: Demersal waters over rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas	Habitat: Demersal waters over structured habitats (natural and man-made), and sand and shell areas
surf clam (Spisula solidissima)	n/a	n/a	Habitat: Throughout	

			bottom sandy substrate to 3' in depth from beach zone to 60 m.	
ocean quahog (Artica islandica)	n/a	n/a		Habitat: Benthic, most commonly at depths of 25-60 m
spiny dogfish (Squalus acanthias)	n/a	n/a		
king mackerel (Scomberomorus cavalla)	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Prey: zooplankton and fish eggs	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone Prey: zoo-plankton,shrimps, crab larvae, squids, herrings, silversides, and lances.	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone Prey: squids, herrings, silversides, and lances.
Spanish mackerel (Scomberomorus maculatus)	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory Prey: zooplankton and fish eggs	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory Prey: zoo-plankton, shrimps, crab larvae, squids, herrings, silversides, and lances.	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone. Migratory Prey: squids, herrings, silversides, and lances
Cobia (Rachycentron canadum)	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone.	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to	Habitat: Pelagic waters with sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island

	island ocean-side waters from the surf to the shelf break zone. Migratory	Migratory	the shelf break zone. Migratory Prey: crabs, shrimps, and small fishes	ocean-side waters from the surf to the shelf break zone. Migratory Prey: crabs, shrimps, and small fishes
sand tiger shark (Odontaspis taurus)		Habitat: Shallow coastal waters, bottom or demersal		Habitat: Shallow coastal waters, bottom or demersal Prey: small fishies (including mackerels, menhaden, flounders, skates, sea trouts, and porgies), crabs and squids.
dusky shark (Charcharinus obscurus)		Habitat: Shallow coastal waters Potential temporary disruption of benthic prey	Habitat: Shallow coastal waters	
*shortfin mako shark (Isurus oxyrhyncus)		Habitat: Shallow coastal waters		
sandbar shark (Charcharinus plumbeus)		Habitat: Shallow coastal waters Potential temporary disruption of benthic prey	Habitat: Coastal and pelagic waters	Habitat: Shallow coastal waters .
*bluefin tuna (Thunnus thynnus)			Habitat: Pelagic	
*skipjack tuna (Katsuwonus pelamis)				Habitat: Pelagic
tiger shark (Galeocerdo cuvieri)		Habitat: Shallow coastal waters		

Juvenile bluefish are usually found in salinities between 23 and 33 ppt, but can intrude into brackish waters with salinities as low as 3 ppt (Fahay *et al.* 1999). They usually enter inshore estuarine waters when temperatures exceed 20^{o}C and remain as long as temperatures do not exceed 30^{o}C, emigrating to open ocean waters when temperatures decline to 15^{o}C. They cannot survive temperatures below 10^{o}C or above 34^{o}C (Fahay *et al.* 1999). Temperatures in the spring and summer in the study area never exceed 30^{o}C; therefore temperature is unlikely to be a limiting factor. However, low spring salinities probably prevent bluefish from entering the nearby estuary and Ruritan River until July and August when forage fish such as silversides, white perch, mummichogs, and menhaden, are present (Friedland *et al*. 1988, Juanes *et al.* 1993).

Juvenile bluefish switch from a zooplankton diet to fish at the same time that they enter estuarine waters (Able and Fahay 1998). Bluefish spawn in open ocean waters (Fahay *et al*. 1999).

All four life history stages of winter flounder (eggs, larvae, juveniles, and adults) have been collected in the nearby Raritan River downstream from the confluence with the South River (ACOE 1995) where salinities are higher. Some adults may stray into the study area during the winter, but the absence of YOY in the spring indicates that they and bluefish do not spawn in the Study area.

Windowpane flounder also potentially occur in and around the project area. Adults spawn from February through December, with a middle Atlantic peak in May, while eggs in surface waters peak in May and October. Larvae peak in pelagic waters in May and October, while juveniles and adults utilize a wide range of temperature, depth, and salinity conditions of bottom habitats from Maine to Cape Hatteras.

As stated above, recent fish surveys in the South River Study area only identified two EFH-designated species in the area: bluefish and winter flounder. Other EFH-designated species that occupy the Hudson-Raritan estuary (Table 1) are not likely to occur in the area during the time of year when the project activities will be conducted. Furthermore, they are not expected to occur immediately along the very shallow shoreline at the intertidal zone in the rough wave breaking areas this time of year.

Marine Mammals and Sea Turtles

Marine mammals and sea turtles could potentially occur in the vicinity of the project area. Three species of State and Federal endangered whales—the fin-backed (*Balaenoptera physalus*), hump-backed (*Megaptera novaeangliae*), and right (*Balaena glacialis*) are found significantly farther offshore, but have the (limited) potential to enter the area during spring and fall migration periods. Additional marine mammals include the harbor seal (*Phoca vitulina*) and hooded seal (*Crytophora cristata*), which have been observed utilizing the jetties and Spermacetti Cove as haul-out locations.

Four species of marine turtles have been reported to occasionally inhabit the waters above the borrow area. These are the leatherback sea turtle (*Dermochelys coriacea*), Kemp's ridley sea turtle (*Lepidochelys kempi*), loggerhead sea turtle (*Caretta caretta*), and green sea turtle (*Chelonia mydas*). Three species—the leatherback, hawksbill and Kemp's ridley sea turtle—are identified as endangered species by both the State and Federal governments. The loggerhead and green sea turtles are identified as threatened by both State and the Federal governments. A report issued by Morreale and Standora (1992) documents the occurrence, movement, and behavior of the sea turtle, in particular Kemp's ridley, loggerhead, and green turtle in Long Island waters. A Kemp's ridley tagged with a radio/sonic transmitter migrated by the study area during October 1990.

POTENTIAL IMPACTS

Direct Impacts

Sand extraction activities have the potential to directly affect the life stages of flounder and bluefish. These are the only species that may be present given the time of year restrictions placed upon the project. They have the potential to be siphoned up into the eductor equipment. However, due to the time of year and the small area of shallow, highly disturbed intertidal and subtidal habitat immediately adjacent to the beach, it is unlikely that these species would be present and likely that effects are minimal in this highly dynamic and transitory habitat. Further, the equipment size and design minimize the potential for any direct impact to these species. The eduction area is small (6"), and water spraying out from the nozzles ahead of it to create the slurry is likely to deter any mobile life stages from the area. This dredge equipment is much more localized and less impacting than the hopper dredge design, therefore minimal direct effects are anticipated.

Indirect Impacts

It is anticipated that the proposed slurry excavation and deposition will temporarily increase suspended sediments and turbidity in the surrounding area (up to 3 acres total), thereby disturbing benthic habitats, as alongshore currents and breaking waves disperse the suspended sediments from the slurry site. This affect is expected to be temporary and localized as tides and wave action will quickly restore sediments to normal conditions in this highly disturbed, dynamic mixing zone along the beach and intertidal zone. Temporary, minimal disruption of the benthic prey organisms and the food chain is expected within the borrow and fill sites. There is also the potential for creating/maintaining a chronic cycle of disturbance in the sediment transport system downdrift of the Critical Zone.

Cumulative Impacts

There are no expected cumulative impacts of the project. The implementation of this long term proposed beach restoration project is intended to capture sediment that is passing through the system into the channel and recycle it back to the erosive southern end in the least intrusive way, maintaining the barrier spit.

RECOMMENDATIONS

Potential impacts to the EFH-designated species that potentially occur in the Study Area listed in Table 1 were evaluated. The construction and operation of the sand slurry pipeline is not expected to have any significant long-term adverse impact on EFH for any of these species. The small, localized pumping activity is restricted to the intertidal zone during the fall and winter. Neither would its operation contribute to any existing or proposed action that may have a significant long-term adverse impact on EFH in the Study Area.

Project design has mitigated any potential adverse impacts through equipment design, placement and timing. The project has included a monitoring protocol to measure biological and shoreline characteristics as well as close coordination with regulatory agencies and contractors.

Mitigation Measures

- As per NMFS (2003b) recommendations, prior to extracting any material offshore, an appropriate benthic survey will be completed in the proposed borrow area to determine whether significant populations of bivalve mollusks or other sessile or less mobile species of concern in concentrations that must be avoided to protect EFH and meet related management objectives.

- Prior to extracting any material offshore, an appropriate bathymetric survey will be completed to determine ambient depths throughout the proposed borrow area. Under no circumstances should the borrow area be allowed to penetrate more than 8 feet below present elevations.

- Any dredging, beach placement and subsequent profiling must be completed between October 1 and January 31. This conservation recommendation is necessary to minimize adverse impacts on EFH and ensure its availability when sensitive life stages will be present.

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APPENDIX A: EFH ASSESSMENT WORKSHEET

EFH ASSESSMENT WORKSHEET

ACTION: Sand Slurry Pipeline Beach Nourishment at Sandy Hook, NJ DATE: September, 2002

Step 1. **Use the species list from the EFH web site or other EFH documentation to determine if EFH occurs in the vicinity of the proposed action. If EFH is present make a preliminary determination of impact**

1. INITIAL CONSIDERATIONS

EFH Designations	Y	N	Species
Is action located in or adjacent to EFH?	x		
Is EFH designated for eggs?	x		See Table 1
Is EFH designated for larvae?	x		See Table 1
Is EFH designated for juveniles?	x		See Table 1
Is EFH designated for adults?	x		See Table 1
Is there HAPC at or near project site?		X	Downloaded from NOAA EFH Website and checked with Karen Greene, NMFS Sandy Hook Lab
Does action have the potential to adversely effect EFH of species or life stages checked above to any degree?	*		If no, consultation is not required. If yes, complete form - consultation is required.

* Only the bluefish, winter and windowpane flounder, and sand bar shark potentially occur during this time of year in the Study area.

Step 2. **In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken.**

2. SITE CHARACTERISTICS

Site Characteristics	Description
Is the site intertidal/sub-tidal/ water column?	Intertidal and subtidal
What are the sediment characteristics?	Sandy Hook beaches are composed of well-sorted, medium sized sand (mean=0.4-0.5mm), 80% of which is quartz from the Atlantic Highlands and Shrewsbury rocks) ; 5-10% consists of local glauconite
Is there HAPC at the site, if so what type, size, characteristics?	No HAPC in project area
What is typical salinity and temperature regime?	Salinity is that of open ocean range (35ppt); temperature ranges from 2-3 C in winter to 20-25 C in summer. Upwelling instances may occur several (2-4) times per year with strong and persistent offshore wind.

What is the normal frequency of site disturbance?	**12-15 storm events/ year mobilize the entire beach zone transferring large quantities of sand to offshore and downdrift. Gunnison Beach losses range from 2,000-20,000cy sand during a 1-2 day storm event. Other disturbance is the passage of large sand shoals (40,000-60,000cy) that align and connect to the beach at the updrift end and move alongshore as a unit, temporarily displacing the shoreline.**
What is the area of impact (work footprint & far afield)?	**Maximum Borrow site footprint= 450' l x 60'w x 6'd .** **Maximum fill site impact 3 acres (1 acre on beach face and 2 acres in intertidal and subtidal as sediment is carried longshore**

Step 3.

This section is used to evaluate the consequences of the proposed action on habitat functions and values as well as the vulnerability of the EFH species and their life stages. This step is critical in identifying the EFH species listed in Step 1 that will be adversely impacted based upon the habitat characteristics identified in Step 2 and the nature of the impacts described within this step. The Guide to EFH Species on the EFH web site should be consulted during the evaluation to determine the ecological parameters/preferences associated with each species listed.

3. ASSESSMENT OF IMPACTS			
Impacts	**Y**	**N**	**Description**
Nature and duration of activity(s)			**Maximum of 50 days pumping between October through February/year resulting in 2000cy/day of sand borrowed from Gunnison Beach intertidal zone and deposited on the Critical Zone beach face and intertidal zone**
Will benthic community be disturbed?	**x**		**Sand excavation and deposition sites: minimal disturbance during pumping operation; no lasting effects (restoration within several tide cycles or 2 days). Recolonization and restoration complete by March 15 prior to shorebird return. Dredge design restricts 6" siphon area and is enclosed in a metal sheath for minimum entrapment and disturbance. Water jets spray ahead of siphon to deter animal presence at site. Temporary suspended sediment and benthic disturbance during operation**
Will SAV be impacted?		**x**	**No SAV in highly dynamic intertidal zone.**
Will sediments be altered and/or sedimentation rates change?	**x**		**Limited on-site movement of sand from slurry expected to be carried no more than 2 acres alongshore. Sand is mined from passing or accreting shoals and is not expected to alter sedimentation rates and net accretion .**
Will turbidity increase?	**x**		**Borrow and fill sites are expected to increase turbitiy for a small area (1 and 3 acres max respectively) for a short time period before returning to normal. Minimal, temporary increase during pumping operation**
Will water depth change?		**x**	**No**
Will contaminants be released into sediments or water column?		**x**	**No**
Will tidal flow, currents or wave patterns be altered?		**x**	**No**
Will ambient salinity or temperature regime change?		**x**	**No**

Will water quality be altered?	x		Temporary and minimal increase in turbidity.
Will functions of EFH be impacted for:			If yes, list Species, Life Stage and Habitat Type to be Impacted
Spawning	x		Flounder potentially spawn in the Study area. Highly disturbed and dynamic intertidal zone area is not expected to be used
Nursery		x	Highly disturbed and dynamic intertidal zone area is not expected to be used
Forage		x	Highly disturbed and dynamic intertidal zone area is not expected to be used
Shelter		x	Highly disturbed and dynamic area is not expected to be used for shelter
Will impacts be temporary or permanent?			Temporary impacts only pumping operations
Will compensatory mitigation be used?	x		Minimal impacts are expected

Step 4. This section provides the federal action agency's determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NMFS.

4. DETERMINATION OF IMPACT		
	√	EFH Determination
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: (check the appropriate statement)	x	No more than minimal adverse effect on EFH - there is no need for further assessment. This worksheet is sufficient for consultation
		Adverse effect on EFH is not substantial - use contents of this form to develop written assessment
		Adverse effect on EFH is substantial - a written assessment and methods to avoid or minimize impacts must be provided expanding upon the impacts revealed in this form. Typically, this degree of impact will require an expanded consultation.